

Building Nanomaterials from Bottom up: Preparation, Assembly, and Functionalities

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One of the most important ingredients of nanotechnology is the materials issue. The construction of nanomaterials at the atomic precision involves the tailoring and manipulation of chemical bonds in confined spaces, which has been a cherished hope of chemists. This talk will present some of our recent work on the synthesis, characterization, and applications of metallofullerenes and semiconducting nanoparticles and nanowires. Thin films of metallofullerenes have been fabricated and their electrochemical and photoelectrochemical properties have been studied, pointing to the potential applications in sensor and solar energy conversion. Our studies on nanoparticles emphasize the surface functionalizations, aiming at enhancing functionalities in photoluminescence, photoconductivity, electrorheological effect, etc. A more recent development is the direct soft chemical growth of semiconductor nanowire arrays on metal surfaces at ambient conditions by taking advantage of a completely different mechanism. Such a nanowires-on-electrode module affords a natural device configuration, which could be used directly as, among other things, field electron emitters and electrochemistry-based sensors. Some examples will be given to illustrate the synthesis, characterization, and applications of the assembled nanomaterials.